Amended Claims

1. (Previously presented) A method of magnetic resonance imaging comprising:

  (a) administering a magnetic resonance contrast agent to a subject which contrast agent alters T_1, T_2 and T_2^* magnetic resonance characteristics;

  (b) exciting magnetic resonance in a region of interest of the subject which receives the contrast agent;

  (c) applying a first echo planar readout waveform during the excited resonance and generating a plurality of data lines of first image data;

  (d) applying a second echo planar readout waveform during the excited resonance after the first echo planar readout waveform and generating a plurality of lines of T_2 or T_2^* weighted image data;

  (e) reconstructing the image data to generate a first image representation and a T_2 or T_2^* weighted image representation; and

  (f) correcting the T_2 or T_2^* weighted image representation with the first image representation.

2. (Currently amended) ~~The~~ A method ~~as set forth in claim 1, further including~~ of magnetic resonance imaging comprising:

  administering a contrast agent to a subject which alters T_1 and T_2 magnetic resonance characteristics;

exciting magnetic resonance in a region of interest
of the subject which receives the contrast
agent;

10   applying a first echo planar readout waveform during
the excited resonance and generating first
image data having T_1 contrast;

applying ~~an~~ a refocusing RF inversion pulse ~~between~~
after the first ~~and second~~ echo planar readout
15   ~~waveforms~~ waveform;

applying a second echo planar readout waveform after
the refocusing RF inversion pulse and
generating second image data having T_2 contrast
and some T_1 contrast;

20   reconstructing the first image data into a first
reconstructed image having T_1 contrast;

reconstructing the second image data into a second
reconstructed image having both T_1 and T_2
contrast; and

25   correcting the second reconstructed image based on
the first reconstructed image to reduce the T_1
contrast of the second reconstructed image.

3.   (original) The method as set forth in claim **1**,
further including:
applying a third echo planar readout waveform and
generating the other of T_2 and T_2^* weighted
5   image data.

4.   (original) The method as set forth in claim **3**,
further including:
applying an RF inversion pulse between the second
and third echo planar readout waveforms, such

5   that the second echo planar readout waveform generates T_2^* weighted data and the third echo planar readout waveform generates T_2 weighted data.

    5.   (original) The method as set forth in claim **4,** further including:

         reconstructing the T_2 weighted data into a T_2 weighted image representation; and

5   modifying the T_2 weighted image representation with the first image representation.

    6.   (Currently amended) A method of magnetic resonance imaging comprising:

     (a)   administering a magnetic resonance contrast agent to a subject which contrast agent alters

5   T_1, T_2 and T_2^* magnetic   resonance characteristics;

     (b)   exciting magnetic resonance in a region of interest of the subject which receives the contrast agent;

10   (c)   applying a first echo planar readout waveform and generating first image data;

     (d)   applying a second echo planar readout waveform and generating T_2 or T_2^* weighted image data;

     (e)   reconstructing <u>(i)</u> the T_2 or T_2^* weighted image

15   data and <u>(ii)</u> a portion of the first image data <u>temporally adjacent to the T_2 or T_2^* weighted image data</u> to generate a T_2 or T_2^* weighted image representation; ~~and~~

     (f)   reconstructing <u>(i)</u> a portion of the T_2 or T_2^*

20   weighted image data <u>temporally adjacent to the</u>

first image data and (ii) the first image data to generate a first image representation; and

(g) correcting the T_2 or T_2^* weighted image representation with the first image representation.

7. (Currently amended) The method as set forth in claim 6, wherein the portion of the T_2 or T_2^* weighted readout waveform ~~used to generate the first image representation~~ temporally adjacent to the first image data and the portion of the first image data ~~used to generate the T_2 or T_2^* weighted image representation~~ temporally adjacent to the T_2 or T_2^* weighted image data include interleaved data lines adjacent an edge of k-space.

8. (original) The method as set forth in claim 7, further including:

generating additional data lines by conjugate symmetry.

9. (original) The method as set forth in claim 1, further including:

repeating steps (b)-(f) a plurality of times to generate a series of first image representations and a series of T_2 or T_2^* weighted image representations; and

combining the series of first image representations and the series of T_2 or T_2^* weighted image representations to generate a third series depicting a temporal evolution of the contrast agent in the region of interest.

10. (original) The method as set forth in claim **1**, further including:

    (g) combining the first image representation and the T_2 or T_2^* weighted image representation to generate a third image representation; and

repeating steps (b)-(g) a plurality of times to generate a series of third image representations depicting a temporal evolution of the contrast agent in the region of interest.

11. (original) The method as set forth in claim **1**, wherein the contrast agent includes a gadolinium chelate.

12. (Currently amended) A method of magnetic resonance imaging comprising:

    (a) administering a magnetic resonance contrast agent to a subject which ~~contrast agent~~ alters ~~at least one of~~ T_1, T_2 and T_2^* magnetic resonance characteristics;

    (b) exciting magnetic resonance in a region of interest of the subject which receives the contrast agent, <u>the exciting including applying a radio frequency excitation pulse and subsequently applying a refocusing inversion pulse</u>;

    (c) <u>during a deadtime between the radio frequency excitation pulse and the refocusing pulse,</u> applying a first echo planar readout waveform and generating first image data;

(d) after the applying of the refocusing pulse, applying a second echo planar readout waveform and generating T_2 or T_2^* weighted second image data, wherein at least one of the steps of generating the first image data and generating the second image data includes generating image data using a partial parallel imaging technique;

(e) reconstructing the image data to generate a first image representation and a T_2 or T_2^* weighted image representation; and

(f) correcting the T_2 or T_2^* weighted image representation with the first image representation.

13. (Currently amended) A method of contrast enhanced magnetic resonance imaging in which a subject is injected with a contrast agent that alters T_1 and T_2 decay characteristics, magnetic resonance is excited in a region of interest, the excited magnetic resonance is permitted to decay for a preselected duration to optimize one of T_2 and T_2^* weighting, and after the preselected duration an echo planar sequence is applied to generate T_2 or T_2^* weighted data, which T_2 or T_2^* weighted data is most strongly affected by the effect of the contrast agent on T_2 decay and is secondarily affected by the effect of the contrast agent on T_1 decay which continues after the preselected duration, the method further including:

during the preselected duration, applying another echo planar sequence to generate T_1 weighted data; and

using the T_1 weighted data to correct the T_2 or T_2^*

20   weighted data for the effect of the continuing T_1 decay to generate a T_2 or T_2^* image that is corrected for the effect of the contrast agent on T_1 decay.

14-16.   (Canceled)

17.   (Currently   amended)   The   imaging   method according to ~~claim 15~~ claim **1**, wherein:

in the step of reconstructing the ~~second~~ T_2 or T_2^*

5   weighted image representation, a portion of the encoded and read resonance from the first echo planar readout waveform is reconstructed into the ~~second~~ T_2 or T_2^* weighted image representation.

18.   (Currently   amended)   The   imaging   method according to ~~claim 15~~ claim **1**, wherein:

the first echo planar readout waveform phase encoding includes,

5   phase encoding a first portion of the resonance such that a k_y component single-steps in a first direction, and

phase encoding a second portion of

10   the resonance such that the k_y component double-steps in the first direction;

the second echo planar readout waveform phase encoding includes,

15   phase encoding a first portion of the
            resonance such that the k_y
            component double-steps opposite
            to the first direction, and
        phase encoding a second portion of
20   the resonance such that the k_y
            component single-steps opposite
            to the first direction; and
    the reconstructing step includes,
        reconstructing the first and second
25   portions of the first echo
            planar readout waveform and the
            first portion of the second echo
            planar readout waveform into the
            first image representation, and
30   reconstructing the second portion of
            the first echo planar readout
            waveform and the first and
            second portions of the second
            echo planar readout waveform
35   into the second image
            representation.

    19. (Currently amended) A magnetic resonance
imaging apparatus comprising:
        a main magnet which generates a temporally constant
            magnetic field through an examination region;
5   an RF system which excites and manipulates magnetic
            resonance in the examination region and which
            receives and demodulates magnetic resonance
            signals from the examination region into data
            lines;

10   a sorter which sorts the data lines between a first

        data memory and a second data memory;

        a gradient magnetic field system which generates

        magnetic field gradients across the examination

        region to spatially encode the resonance

15   signals;

        a sequence controller which,

                (i) controls the RF system to induce

                resonance <u>including spin</u>

                <u>refocusing using an inversion RF</u>

20   <u>pulse</u>;

                (ii) controls the RF and gradient

                systems to implement a first

                echo planar readout waveform

                <u>during a deadtime preceding the</u>

25   <u>inversion RF pulse</u> which

                generates <u>non-</u>T_2 ~~T_1~~ weighted

                data lines;

                (iii) controls the RF and gradient

                systems to implement a second

30   echo planar readout waveform

                <u>after the inversion RF pulse</u>

                which generates ~~one of~~ T_2 ~~and T_2^*~~

                weighted data lines, and

                (iv) controls the sorter to sort the

35   <u>non-</u>T_2 ~~T_1~~ and T_2 ~~or T_2^*~~ weighted

                data lines between the first and

                second data memories; and

        a reconstruction processor which reconstructs data

        lines from the first data memory into a first

40   image representation and data lines from the

second data memory into a second image representation.

20. (Canceled)

21. (original) The magnetic resonance apparatus as set forth in ~~claim 20~~ claim 19 wherein:
   the sequence controller controls the sorter to sort

(i) all of the ~~T_1~~ non-T_2 weighted

5   data lines and a portion of the

T_2 ~~or T_2^*~~ weighted data lines

into the first image memory and

(ii) all of the T_2 ~~or T_2^*~~ weighted

data lines and a portion of the

10   ~~T_1~~ non-T_2 weighted data lines

into the second image memory.

22. (original) The magnetic resonance apparatus as set forth in claim 19 wherein the RF system further includes:
   a phased array receive coil; and

5   a partial parallel imaging (PPI) integrator which processes the readout of the phased array receive coil to generate data lines.

23. (original) The magnetic resonance apparatus as set forth in claim 22 wherein the partial parallel imaging (PPI) integrator processes the readout of the phased array receive coil using one of a simultaneous

5 acquisition of spatial harmonics (SMASH) technique, a sensitivity encoding (SENSE) technique, and a parallel imaging with localized sensitivities (PILS) technique.